INQUIRY-BASED INSTRUCTIONAL STRATEGIES AND SCIENCE CONTENT VOCABULARY

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Background

Among students, science is commonly thought of as a challenging subject. I believe one reason that students find learning science difficult is that it introduces a significant amount of content specific academic language that many students have not been exposed to previously. Throughout my teaching career I have observed that students struggle with learning science content vocabulary which led me to question if there were instructional strategies I could implement in my curriculum to help them better learn vocabulary terms. Literature has shown that intentional vocabulary instruction supports student understanding of scientific concepts. Due to the sophisticated academic vocabulary in science, students need help in learning and processing academic vocabulary and language to become independent science learners (Snow, 2010).

Methodology

This Capstone project was conducted at Heritage High School in Littleton, Colorado. Heritage High School is a comprehensive neighborhood school that has earned the national Blue Ribbon of Excellence designation. Treatment was implemented in three freshman level physical science classes (*N*=87) during the months of January, February and March 2017. Content-specific vocabulary terms were taught using traditional direct instruction and compared to vocabulary instruction using the inquiry-based strategies 5E Learning Cycle and gamification. For each instructional strategy, students were given a vocabulary pre- and post-assessment to determine student acquisition of the terms. Students also completed an input survey to give feedback on which instructional strategies they enjoyed the most and felt were effective in helping them learn content vocabulary.

Results

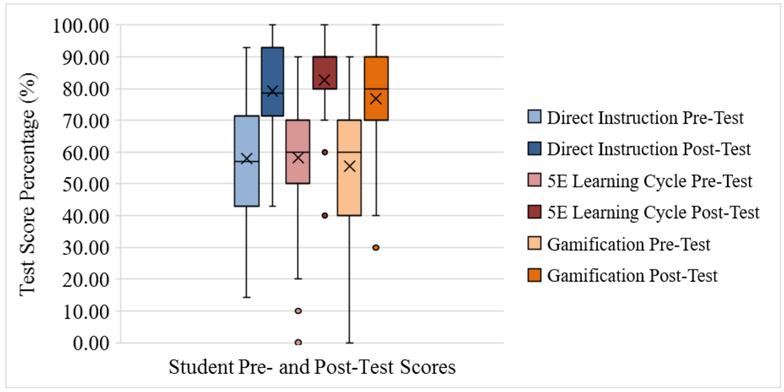

Figure 1. Box-and-whisker plot of pre-and post-test scores for direct instruction, 5E learning cycle, and gamification instructional strategies, (*N*=87).

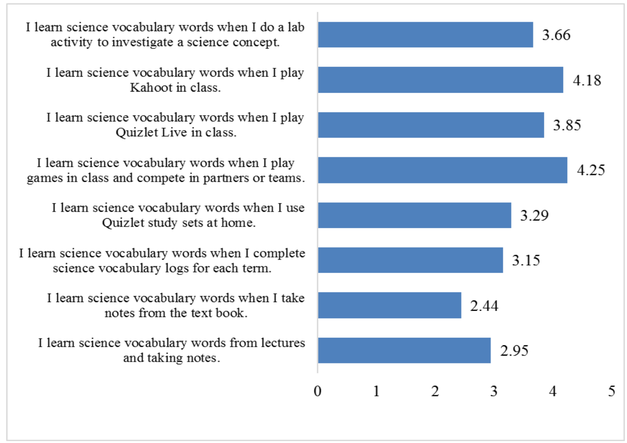

Figure 2. Average response rating on student input survey.
Note. 5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree, (*N*=87).

Focus Questions	Data Source 1	Data Source 2	Data Source 3
1. What is the effectiveness of direct instruction instructional strategy on student acquisition and retention of science vocabulary words?	Direct Instruction Physics Vocabulary Assessment	Student Input Study	Interviews
2. What is the effectiveness of 5E Learning Cycle instructional strategy on student acquisition and retention of science vocabulary words?	5E Learning Cycle Physics Vocabulary Assessment	Student Input Study	Interviews
3. What is the effectiveness of gamification instructional strategy on student acquisition and retention of science vocabulary words?	Gamification Physics Vocabulary Assessment	Student Input Study	Interviews

Conclusions

Data results indicated that the 5E Learning Cycle was likely more effective at improving student acquisition of science content vocabulary. Analysis of pre- and post-test scores showed that all three instructional strategies significantly (ρ = 0.00) improved student acquisition of science content vocabulary, however there was no significant difference between the three strategies. Comparison of data results as seen in the box-and-whisker plot suggested the 5E Learning Cycle may have had more of an impact on student acquisition of vocabulary terms than the other two instructional strategies (Figure 1). The 5E Learning Cycle improved average student scores by three percentage points more than the other two instructional strategies. Additionally, the standard deviation of the 5E Learning Cycle post-test data decreased almost three times that of direct instruction and gamification . The lowest student post-test score for the 5E Learning Cycle was much higher than the other two instructional strategies, indicating this strategy was more effective for students that struggle with science vocabulary the most.

The average response rating was calculated for each question in the Student Input Survey given after implementation of the treatment. Each student response was analyzed using the following scale: 1 = strongly disagree, 2= disagree, 3 = neutral, 4 = agree, 5 = strongly agree. Students felt that direct instruction strategies were the least effective in helping them learn science vocabulary and rated these strategies the lowest on the Student Input Survey. Students rated the gamification and 5E Learning Cycle strategies the highest indicating these strategies were most well received by students. This was also supported in student interviews. Students stated the gamification and 5E Learning Cycle were more interactive, increased their motivation, and helped them to visualize the vocabulary words on the post-test.

Acknowledgements

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References Cited

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